Before the
Federal Communications Commission
Washington, D.C. 20554

In the Matter of	)	
	)	
Implementation of Sections 255 and 251(a)(2)	)	
of the Communications Act of 1934, as Enacted	)	
by the Telecommunications Act of 1996	)	
	)	Docket No. 96-198
Access to Telecommunications Service,	)	
Telecommunications Equipment and	)	
Customer Premises Equipment	)	
By Persons with Disabilities	)	
	)	

Comments of Trace/Gallaudet

The Trace Center of the University of Wisconsin-Madison and Gallaudet University's Technology Assessment Program have extensive experience in engineering, research, consultation and guideline development regarding accessibility of technology to people with disabilities. The two groups collaborate on a Rehabilitation Engineering Research Center on Telecommunications Access, funded by the National Institute on Disability and Rehabilitation Research (NIDRR).

The opinions expressed here represent those of the authors and not those of the host institutions or funding agencies.

Introduction

The Trace Center and Gallaudet's Technology Assessment Program thank the FCC for the opportunity to comment on emerging technologies that affect the accessibility of telecommunications for people with disabilities. By anticipating the effects of new technologies and shining a light on emerging telecommunications access issues, the FCC can encourage industry to build in accessibility during the development of standards and products.

One of the fundamental issues in this inquiry is whether the FCC has jurisdiction with regard to telecommunications accessibility when IP is used in telephony. We assert that this is unequivocally the case. When IP technology is used to orginate, route, and terminate telecommunications as defined in the Telecom Act, it is subject to the requirements for accessbility and compatibility where readily achievable.

In the following section we outline the basis for the FCC's jurisdiction in this area. Following this section we address the NOI's specific questions on access issues, FCC response, industry response, other new technologies, and other issues.

I. IP Telephony and Section 255

A. IP Telephony is covered by Section 255

The definition of telecommunications in the Telecom Act is**:**

> *The term 'telecommunications' means the transmission, between or among points specified by the user, of information of the user's choosing, without change in the form or content of the information as sent and received.*

This definition is a functional definition and not technology-specific.

The definition of information services in the Act is:

> *The term 'information service' means the offering of a capability for generating, acquiring, storing, transforming, processing, retrieving, utilizing, or making available information via telecommunications, and includes electronic publishing, but does not include any use of any such capability for the management, control, or operation of a telecommunications system or the management of a telecommunications service.*

This definition excludes conversations such as those typically conducted during telecommunications. It also is not technology-specific.

Section 255 covers telecommunications. IP in and of itself is not an information service. The ability to place phone calls is involved. Conversation is the primary function. The underlying technology and the mode of communication (voice, text, etc.) are not specified as

limiting factors in the definition of telecommunication. Transmitting phone calls via IP does not change them from telecommunications to information services. IP is a transport protocol and is not confined to Internet technologies. It can be (and is being) used for telecom transport as well.

B. **Conversations should be considered telecommunication regardless of the modality used.**

The definition of telecommunication does not limit itself to conversations using voice. In fact, conversations using text (such as using TTY's) were not only envisioned but were commonplace and protected elsewhere in Federal legislation. Thus, in considering what constitutes telecommunication it is urged that telecommunication include conversations that are carried out using speech, sounds, text and any other modalities that are used for carrying out a conversation.

There are already services available where an individual can talk into a standard POTS telephone on one end of a conversation and the person at the other end (in a noisy environment or in a meeting) can view the conversation in text. The second person can then respond (silently) in text, which is converted to speech for the person using the phone. Because half of the communication is occurring in text and half is occurring in speech, does that mean that only one person is telecommunicating?

In other cases, one person may be talking and the other person listening (speech in one direction), but the individual types the responses back, which are viewed by the first person (text in the other direction). Is this telecommunication in one direction but not telecommunication in the other?

C. **Scope of telecommunication definition**

The clearest action, and the one that will be most robust in light of the continuing technical advances would be to recognize all forms of conversation over technology as being telecommunication. We would propose that if a device or service permits phone calls (to a phone number or its future equivalent or alternative) that device or service is undeniably within the realm of telecommunications and, as such, would be covered by Section 255.

When Congress passed the Telecommunication Act, it was their intent that Section 255 apply to those things which people used to call up and converse with each other whether they were shaped like footballs or speakerphones or antique phones or objects of art. It is clear that they tried to separate information services from telecommunication services. However, they did not provide any indication that a telephone call that went over a piece of fiber optic network should be treated differently than a phone call that went over copper wire or one that was transmitted using a microwave link. The distinction was in whether it was a telecommunication versus information service, not whether it was carried over one particular type of transmission technology or another.

D. **All telephony will be IP telephony**

In the not-too-distant future it is possible that all telecommunications will be handled by adapting IP to voice traffic. If the term Internet is used to refer to the information backbone in our country in the future, then there will likely not be any phone calls or telecommunication of any type that will not occur over these information networks (collectively known as the Internet). It should be noted that this 'Internet' will be all digital – but not necessarily all TCP/IP. (Just as all legs of the current 'Internet' are not TCP/IP. Other technologies are used to transport over wireless, satellite and even some long line trunk portions of the net.)

Even today, some POTS to POTS phone calls are carried at least part of the journey (if it is a long one) in a packet based system. Telecommunications equipment comprises a complex myriad of different technologies that are used to enable communication by users between two points of their choosing.. The fact that IP is one of these technologies is usually completely invisible to the users.

E. **TCP/IP is already being used in telecommunications**

In some cases, the same IP connection is used to provide both Internet access and what looks like regular telephone service from a location such as a business. That is, telephone users at a location will pick up a phone and dial a phone number believing they are using a "standard phone" to call another "standard phone." In fact, the phone they are using may communicate with the telephone company using a TCP/IP line. The phone at the other end of their call may either be a standard POTS phone or another similar phone that looks and behaves like a POTS phone. Should employees or customers of one company (or hotel) be covered but not those of another?

F. **A telephone call that is routed (or carried entirely) over an IP network is still telecommunication and does not become an information service.**

There seems to be a misimpression that transmitting phone calls via IP changes them from phone calls into information services. If digitizing a call or transporting it over a digitized network changes telecommunication into an information service then a large percentage of today's phone call are already not telecommunication.

G. **IP will be like electricity.**

IP-based networks will (surprisingly quickly) evolve into the **information** AND **communication** system for the entire country, which will permeate our businesses, schools, homes and lives in the same way that electricity does today. This system will carry all of our information services AND our telecommunication services. It will extend to wired and wireless systems and will even operate over the standard power wiring in our homes and businesses.

It is already possible to connect products, including telephones, throughout your house by simply plugging them into the electrical outlet and using the electrical wiring from the house for the network wiring. This will include the ability to connect both traditional PSTN (true

today) phones or IP telephones (in the near future) by simply plugging them into a standard wall three-prong power socket.

H. **Rather than two basic way of providing IP telephony, there will be an infinite variety.**

In the NOI it was stated that there were two basic ways of providing IP telephony (paragraph 177). One was phone-to-phone and one was computer-to-computer. In fact, IP will be used throughout telephony for reasons of cost savings and other advantages of mixing data and voice communications with one technology. We can see IP telephony occurring in all of the following cases:

- POTS phone to POTS phone (with an IP link in the middle)
- POTS phone to IP Phone (standard looking phone that connects directly to IP networks)
- POTS phone to computer
- Computer to IP phone
- (Future) Palm Pilot (acting as a phone) to POTS telephone
- (Future) Web TV (acting as a phone) to POTS telephone
- Car audio system (acting as a cellular phone) to POTS telephone
- Elevator intercom to 911 Center
- Cellular phone to baby monitor
- Video entertainment wall screen/telephone to cellular phone
- Video teleconference room to pocket computer (acting as a phone)

…and any combination of the above.

I. **There are two kinds of regulations -- those that should NOT be carried from old technologies to new ones and those that must.**

As pointed out in the FCC Office of Plans and Policy working paper #31, "legacy regulations should not automatically be imposed on new technologies." In many cases they may no longer apply or be necessary. Some have read this to say that they should never be applied. **We suggest that the use of IP as a transport protocol for telecommunications does not in any way alter the fundamental need for telecommunications to be accessible.** Nor does the incorporation of IP as the transport protocol ensure accessibility of the instruments at either end or the transport "wire" itself. Thus, moving from old to new technologies for transport in this case (disability access) is not a case where carrying regulations or requirements forward is undesirable or unneeded.

Working paper #31 also states: "When Internet based services replace traditional legacy service, begin to deregulate the old instead of regulating the new." Again, there are issues (such as competition) where this may be true. But it should not be taken as a maxim. There are issues where it is also clearly desirable to carry regulations forward, updating them as necessary. These would include areas that deal with health, safety and human rights. For example, in a slightly different arena, if email replaces mail it would not make sense to drop regulations around mail fraud. Rather, fraud regulations should be carried forward and updated as necessary to cover fraud perpetrated using email. If a new type of transmitter is

designed, RF interference with existing technologies or emergency services should not necessarily be dropped. Similarly, it is doubtful that Congress intended for section 255 to be dropped if the transport mechanism for carrying the phone calls across the country were changed or if combination phone-and-something-else appliances became popular in homes, hotels or businesses.

J. **Technology regulation and product regulation must be separated and handled differently.**

As a result of the above blurring of lines between the various technologies (as seen by the user), it is important that basic product regulation not be tied to the technologies but rather to the function or service that is provided. **Otherwise, it is likely that a consumer could switch from one telephone service to another apparently identical service** (which allowed them to use the same phones in their home as they did before) **and then later find that protections that were available to them last month were no longer available because the "new phone service" used a technology exempt from the regulations.** In the case of some consumers with disabilities, this may mean that the phone service or product they just signed a contract for is not usable for no apparent reason.

K. **Classifying computer based telephony separately from other telephony will not work – given the current trends in computer, information appliance and telecommunication product design and integration.**

Although in the past, it was possible to find telephones which did not include computer technology, there are essentially no telephones today that are produced which do not have computer technology in them. The cost to produce small central processing units has dropped to the point where it is even possible to find small computers in electric shavers where they do nothing but help control speed and battery charging. Similarly, even the least expensive phones have small processors in them that control all of the functioning of the phones.

We are also likely to see functions, currently carried out by personal computers, that will increasingly be carried out by information appliances. We are already seeing devices on the market which send and receive e-mail, browse web pages, and make phone calls, but which have none of the typical characteristics associated with personal computers (floppy disk drives, etc.). In fact, some of the devices have handsets and look more like telephones than computers. Increasingly, we are going to see a continuum of products that no one would suspect had computer technology in them (light switches, coffee makers, doorbells) all the way up to devices that clearly look like our current envisionment of a computer. There will be no clear breaks in this continuum and it will be difficult or impossible to decide where a computer begins and where it ends.

In addition, we are also likely to see homes where all of the electrical devices in the home are all interconnected together in a network which is likely to include, at least some place in the network, one or more things which might be thought of as computers. Further, the function of the various items in the environment will be affected by the other items and the computers.

In other homes, there may be nothing that resembles a computer as we think of it today. Instead, it would just be a number of different information and communication appliances scattered throughout the house. Individuals will be able to make and receive phone calls from a variety of different types of devices, including those that are both audio only and audio/video.

As a result, it is not useful to try and separate telephones or communication into computer based and non-computer based. This will only invite confusion as the lines between computers and information in communication appliances continues to blur.

Instead, it is recommended that telecommunication be treated as a function. Any products that are designed and marketed to be used to carry out telecommunication be recognized as being covered under the Act (at least those portions of them which are used for telecommunication).

II. Responses to Specific Queries in the NOI

175 –A. To what extent has Internet telephony begun to replace traditional telecommunication services?

The specific answers to this question are best answered by industry.

Press reports (see Pappalardo, D., and Green, T., Jan. 11, 2000) indicate that major carriers are readying for significant deployment of IP for telecommunications carriage in the next 18 months. CPE using IP for telephony is not currently widely used outside organizations, according to the article: "A recent study by Faulkner Information Services indicates that only 7% of enterprise customers have deployed any voice over IP, and those who have installed it in only small pilot projects in least-critical environments."

It appears that, although the pace of change is rapid, and there are plans for widespread application, the deployment has not yet begun in earnest. There is therefore an opportunity for industry to solve any problems that exist and to avoid new barriers before they become troublesome.

175 –B. What are the usage patterns (of Internet telephony) by person's with disabilities?

We do not have statistics on usage patterns by people with disabilities. If the service is inherently accessible to an individual with a disability (for example, someone who uses a wheelchair and has no limitations of use of the arms), then we have no reason to believe that usage differs from that of the general population. Where a product does present a barrier, it is unlikely that you will find persons with that disability availing themselves of the service.

Two of the main problems with tracking usage patterns and barriers with IP telephony are that (1) the user is not necessarily the customer (may encounter the technology at work or while traveling), and (2) the source of the problem is nearly impossible for the user to trace.

A better line of questioning might be "What is the usage pattern in the general population (i.e., as in Question 1 above)? What is or will be the impact on society at large or on anyone who could not use the technology? How widespread would use be in general? Will the technologies be or become pervasive or standard? Will use (or inability to use) the technologies affect employment? Will they affect our culture of communications? If a telecommunications technology is widespread, unavoidable, able to affect employment, and part of our culture, then it should be a high priority with regard to accessibility. Unfortunately, if we wait until a technology is already widely deployed, we will be in a retrofit situation.

For example, with voice mail, IVR, and wireless technologies, the technologies have become widespread before access issues were addressed or solved. In the case of IP telephony, there is an opportunity for industry to solve them in advance of their widespread deployment.

175 –C. What is the impact of computer based applications that provide telecommunication's functionalities further into the customer's premise than the point of connection to the public network, such as voice mail capability that resides in a computer connected to a PBX, rather than a PBX.

It is clear that telecommunication functionality is moving from its current locations (in CPE, in PBXs, Central offices etc.) and being distributed across the entire continuum of CPE to (multiple interacting) network services. Further, in most cases, the individuals who are using these services will be completely unaware as to whether or not they are located in a central location or at the customer's location. Finally, the impact to the consumer, their inability to access these services and functionalities, will be the same whether they are central or at the customers location.

It is also clear from the wording of the Telecommunication Act that the drafters intended the telecommunication system to be accessible from end to end, because b customer premises equipment, network equipment, and services were covered in the scope of 255.

This question also asks a specific question about functionality which resides in a computer connected to a PBX rather than in the PBX itself. As discussed above, referring to something as being in a computer versus in a PBX is a rather constructed way of looking at things. First of all, the PBX itself contains a computer--in fact, a fairly large number of computers (microprocessors) working together to originate, route, and terminate telecommunications.. Adding another processor to this cluster and delegating some of the tasks off to this other processor is really no different than inserting another board into the PBX case. It should be considered the same as any other hardware or software upgrade.

The future of organization based telephony is likely to be a TCP/IP version of the PBX. The open architecture, ease of changing components, and ability to integrate voice telecommunications with data are attractive features. (Riezenman 2000)

Unless these future versions of the devices which are used to carry out the telecommunications functions of today's business phones are required to follow 255 regulations (where readily achievable) then employees with disabilities working at these locations and customers who must use these facilities will lose basic phone accessibility as companies shift to these new technologies..

This would be unfortunate since the way these new telecommunication products are being designed (and the technologies being used to design them) make it easy to design them to be cross-disability accessible without impacting price or functionality for other users. In fact, most all of the accommodations would also be a benefit to large numbers of other users (as curbcuts and closed captions on television are today).

176 -A To an extent will government regulations be necessary to ensure accessibility of communication technology in the future.

We've just carried out a rather extensive study of different industries looking at when and why companies build accessibility into their standard products (practice universal design or not) and what factors seem to account for it. Although there are many different factors that seem to account for exactly when and where accessibility is considered in standard product design. However the only two factors that appear to have reliably affected this practice (building access into standard products):

- Regulation (or a threat of regulation)
- Profit

It is not that companies don't have a sense of duty or feel that building access in would be important. It is just that there are so many things that need to be done and it is so competitive that:

1) **important things don't get done - only very important** and or **urgent** things get addressed before the day ends each day
2) **if a company doesn't know (for certain) that the competition is doing it** then it is scary to take time out to do it themselves.

It is therefore critical that the FCC play a role in this process if anything is to actually happen to ensure that future technologies are accessible.

Specifically, the FCC must:

1) Provide clear enough rules and substantial enough enforcement that accessibility is a **very important** or **essential** component to a product's design (and not just a good or an important component).

2) Structure regulations such that all competitors (using all technologies) must address the issue so that there is a level playing field (so that no one feels that they are losing ground if they spend any effort at all address this issue.

179 -A. To what extent might phone to phone IP telephony services impact the disability community and what steps should we take to address any adverse impacts. Please offer specific suggestions as to the appropriate role of the commission in guaranteeing access and the statutory basis for that role**.**

Phone to phone IP telephony is in its infancy. An assessment of impact would require cooperative efforts of the user community and industry. One area that has been documented is the problem of garbling of TTY conversations. Other issues are more hypothetical.

Garbling of TTY

Some voice-over-IP technology garbles TTY. Currently the problem is very limited because the technology is not widely used in the telephone network. However, when carriers increasingly employ IP telephony in their networks, the extent of the problems may increase. CPE is of concern because it may affect consumers' employment (if seeking employment in an organization with an inaccessible telecommunications system or carrier) and safety (e.g., when traveling and staying in a hotel with an inaccessible phone system).

Access problems must be identified by people who use the technology. But there is no way for either party on a garbled TTY call to know the source of the problem. If a TTY user places a call to another TTY and garbling occurs, most users are likely to think the TTY is broken. Some may know enough about text telephones to investigate whether background noise is causing the problem (particularly if the device is coupled acoustically) but since most text telephone users cannot hear well, there is typically no way to find this out with any certainty. Few would suspect that network technologies were the source of the problem, because this has rarely been the case in the past. To complicate things further, wireline network technologies will not necessarily be to blame. The garbling could be the result of a LAN/PBX of one party's employer or a hotel in which one of the parties is staying.

Transmission problems on a voice call can often be described in terms of the sound – static on the line, distorted voice, noisy background. With TTY garbling, there are no such noticeable qualitative differences in the garbling of characters. This makes diagnosing a problem even more difficult.

It is important to note that TTY as a service is not limited to two-way live chat by text. Another important function in this service is generally called voice carry-over (VCO) and hearing carry-over (HCO), in which one party uses voice and the other, text. Alternating voice and text (or in some forms, having simultaneous voice and data available during the

entire call) is an important component of TTY over voice networks. Currently, VCO and HCO would appear to be affected only to the extent that TTY is garbled. However, in future implementations of voice and text, the situation is uncertain. The protocol would need to support both functions on a call; ideally simultaneous use of both channels. VCO and HCO are required by the FCC under the TRS rules. Both must continue to be supported. In fact, it would appear that digital technologies would enhance the mixing of the two, but there is no guarantee that the industry would support it.

Intelligibility of Speech

We raise the question of intelligibility of voice over IP to people who are hard of hearing. Compression of speech for efficiency/cost savings is a strong trend in telecommunications. Listeners' judgment of speech quality over packet-switched technologies is measured through a standardized metric called the Mean Opinion Score (MOS). The listeners in evaluations of codecs are hearing people. People who are hard of hearing, especially those with severe hearing loss, may find it more difficult to understand speech that has been compressed and that is judged of lower quality than "toll" quality speech. We do not know whether this will be a problem; in fact it is possible that less-noisy connections could improve accessibility. We invite industry to work with us in assessing the effects on people who are hard of hearing.

If speech quality is lower with some VoIP applications, there could also be an adverse effect on people whose speech is impaired. They could find themselves less able to be understood by others. This would include hearing people with speech disabilities, as well as people who are deaf or hard of hearing and who use VCO. Again, this type of problem would be difficult if not impossible for consumers to trace.

179 - B. Please provide specific definitions of these services or equipment to which the statute might apply and the appropriate means of limited its application to only those services and equipment.

Service definitions

The definition of telecommunications implies that conversation is covered as a major function of telecommunications. We propose that mode of conversation not be limited to voice, but include text and video telephony. This concept of "Total Conversation" has been devised by Gunnar Hellstrom as a way to ensure accessibility of multimedia telecommunications in the future, across different types of technology. (See Appendix **). The service definition for Total Conversation is now being crafted in ITU-T Study Group 16, and exists more informally in other ITU documents.

In addition, we urge the FCC to establish text telephony, with VCO/HCO as a component, as a class of service. This is proposed to help ensure that deaf people have a stable means of telecommunication just as voice users do, as technologies change. This

step would also assist in compatibility efforts by establishing standards. Finally this step would assist in the migration of text telephony from analog to digital technology.

The legislative history on text telephony is not limited to Section 255. Text telephony is also the subject of the Telecommunications Enhancement Accessibility Act of 1988, ensuring access for TTY users to Federal Government, and the Americans with Disabilities Act of 1990, which required text telephone accessibility to 9-1-1 service; established a telephone relay service to open up telecommunications network to text telephone users; and in guidelines establishes telecommunications access requirements in public accommodations. Although the FCC has limited jurisdiction under these laws, the FCC would be contributing to problems of implementation of these laws if it did not shepherd text telephone functionality (via compatibility or direct accessibility) through the changing technologies of telecommunications.

We find that, with every industry segment addressing compatibility for the first time, the same information is needed: key functionality of TTY, signal characteristics, services that must be supported. We have taken steps, working with the TTY industry, to formalize in an industry standard the characteristics of Baudot TTY signals in products in the field. A draft standard has recently been favorably balloted and should become a TIA standard shortly. But the TTY market has changed in the past few years with the diffusion of proprietary protocols, which perform better than traditional Baudot but pose new compatibility issues and issues of intellectual property. The service definition for TTY would need to include important functions such as VCO/HCO, visual means of monitoring call progress including whether answered by voice, ring signaling, and a means of letting a hearing person (e.g., 9-1-1 agent) know that a TTY is on the line, ability to successfully transfer the calls, and other functions.

Video telecommunications should also be defined as a service, as it meets the definition of telecommunications and for some people it is the only means of giving a counterpart to voice service (through sign communication by deaf people).

179 -C. Please describe specific access issues or experiences that might arise with IP telephony.

In addition to phone-to-phone IP telephony, addressed in 179-A above, other implementations of IP telephony (and other computer-telephony integration technologies) will present some new barriers as voice communications begins to incorporate more visual elements.

In the area of visual impairment/blindness there is a very severe threat of loss of access. Newer phones are increasingly using techniques such as “soft buttons” and touchscreens. Soft buttons are buttons which appear along the edge of a display and which do not have any set function. The function of the buttons changes from moment to moment with the current function being displayed on the screen. For example, there may be two buttons immediately

below the LCD screen which are labeled (on the LCD screen) as “directory” “and redial.” As soon as you begin to dial numbers, the functions of these two buttons immediately change to “backspace” and “okay.” Once the call is in progress, the functions of the two buttons change to “transfer” and “hold.” As a result, an individual who is blind has not idea what the function of these buttons is from one minute to the next unless they can see the display (or some other provision for access is provided). Touchscreens are also increasingly appearing on products. The problem here is twofold: (1) the individual cannot feel *where* the buttons are and (2) they cannot identify *what they do* since they change from one minute to the next as the screens change.

There are very easy mechanisms for making both types of phones accessible to people with low vision and blindness. However, unless telephones that operate over packet networks are covered (as are all other phones) then, as all phones evolve into packet based technologies, they would evolve out from under the Section 255 regulations. One might assume that the people with disabilities could simply purchase the accessible phones (if there are any on the market). Unfortunately, a large number of the phones that an individual must use are those they find in where they work, in the hotel rooms, in public places, and even in homes they are visiting. In all these cases they do not have the ability to choose but must be able to operate the phones they encounter.

180 -A What efforts are manufacturers of equipment that perform phone to phone IP telephony functions and providers of phone to phone IP telephony services currently making to ensure that equipment and services are accessible?

We defer to industry on this question, noting only that there are some standardisation activities to make the gateways between the circuit-switched technologies and packet networks be “text telephone aware.” (See our discussion of text telephony standardization and migration, section 8E, below). But the main effort in that standardisation is currently financed by the Rehabilitation Engineering Research Center on Telecommunications Access through Gallaudet University.

Standards are important, but they must be implemented before being of any importance to the user.

180 -B. What improvements in accessibility may be possible through the use of phone to phone IP telephony.

Using the definition of **phone to phone IP** telephony as described in the NOI, there are no known advantages that would boost accessibility. The type of phone to phone IP telephony described in the NOI involved the use of a standard wire line phone which was connected to an IP trunk at the phone company then later converted back to an analog phone and delivered via another standard POTS phone. Since this, essentially, involves the chaining of the two technologies, the concept of “weakest link” applies. Those things that would be possible over a purely analog network would not apply since it is a packet network in the middle. Those advantages which might exist over a purely packet

network would not apply since both ends are analog. Thus, there are no known advantages over pure analog system (except possibly the greater quality of signal over long calls due to the digital transmission in the middle. However, this quality would be no greater over IP than it would over be over ATM or other digital transmission technologies.)

In contrast, pure phone to phone IP telephony **would** provide **many potential** advantages. If IP communication was used from end to end, then there are a number of potential advantages over an analog end to end phone. the ability to select one or more communication modes offers the potential for access by users who can perform some functions but not others. Because the products are heavily based in software and because they are still being developed, building in access could still be done without retrofitting.

Some examples below highlight the functions of communications and conversation.

- All voice traffic could include as part of the standard implementation a two-way text channel and protocol. This would mean that any two parties who have screens and keyboards on their IP CPE could carry on text conversation as well as voice conversation. This would permit direct communication among deaf and hearing people without the use of relay service. The data rate used in text chat is so low that this presents virtually no barrier with regard to bandwidth. (Refer to "Total Conversation and Text Telephony in the IP Revolution," by Gunnar Hellstrom, Rapporteur in ITU-T Q9/16 Accessibility to Multimedia Systems and Services.") If such a system were also compatible with TTY it would also be an important component to the eventual migration off of TTY.

- Mixing of voice and text could easily be accomplished in order to support simultaneous and text, which would improve the services we now call VCO and HCO (alternating or two-line telecommunications).

- Video for telecom conversations is another important medium within digital telephony, including IP telephony.
  - For people who are hard of hearing and need to see the speaker (lipreading and facial expression) to fully understand conversations, video will make the network more accessible. (This group of users would include a sizeable proportion of the elderly population.)
  - For people who are deaf and use signing as their primary mode of communication, video has obvious advantages for a sign language phone. Throughout the limited history of telecommunications access for deaf people, they have never had access to natural phone conversation that others enjoy.
  - Video telecommunications can also be used for video relay interpreting of phone calls, or for remote interpreting of meetings.
  - Video telecommunications would also be useful to people who have speech disabilities but not enough motor skill to type; their speech could naturally be augmented by visual cues such as facial expression, gesture, use of a communication aid, and so on.

- The ability to conference-in more than one party on a multimedia call will make it easy for calls
  - to be interpreted
  - to be "captioned"
  - to be otherwise assisted by a third party (interpreter, captioner, speech-to-speech assistant) on the same call/conference.

- Routing of telecommunications will become more sophisticated.
  - A marker within the address could be used to tie in a relay service when a call is being made from a text only terminal to a voice terminal. The relay service could come on line to help mediate the mode of communication. If both parties have text, the call could proceed in text; if not, the relay could serve in to transcribe and speak for the parties on the call.
  - In general, the ability to specify user preferences in the addressing scheme could allow for more customization by disabled users.

- If bandwidth and voice quality can be varied on demand by either party in a conversation, some users could chose high fidelity voice to assist with hearing. For some years, there has been talk about prescription hearing via telecommunications for people who are hard of hearing. In other words, the frequency response, amplitude, background noise, and other characteristics could be selected and (ideally) adjusted on the fly by the user. To date, it has not been implemented but with digital end-to-end services, it could be.

- Transcription of voice: Just as people who are blind can use speech synthesis to read e-mail, people who are deaf will be able eventually to use speech recognition to see voice conversations .

180 -C Can greater accessibility be achieved if requirements are adopted early in the development of IP telephony.

Yes, most definitely. In fact, if it is clear that IP telephony is just a subset of telephony and, therefore, covered under the Section 255, most of the accessibility provisions can be incorporated into the standards and into standard practice from the beginning so that accessible phones are the normal practice.

180 -D. Is it possible that greater levels of accessibility will be readily achievable with IP telephony than will conventional telephony.

Yes, but only for pure IP telephony (that is, telephony that is IP from end to end). Situations where conventional telephony is chained serially with IP telephony will continue to have the limitations of conventional telephony.

The advantage of this technology is that it is open and software based. If developed early enough, many of these features will be readily achievable. Will market forces alone make it happen? No one knows the answer to that question, but if history is a guide we can project that some new functions will provide enhanced accessibility, while others will erode it. We look at the example of digital wireless telecommunications, whose access problems are being resolved for TTY users through FCC orders, but whose access problems for hearing aid wearers are not yet solved. On the other hand, many people with other types of disabilities, such as those that affect mobility, find low-cost wireless telecommunications a tremendous aid to accessibility and independence: Accessibility is enhanced for them.

180 -E. How will compatibility with assistive technology effect the use of IP telephony.

As assistive technology evolves to include IP connectivity, there will be great benefits. Individuals who are not physically able to operate IP telephones due to extreme physical disabilities will be able to use special assistive technologies to control the phones and/or to connect directly to the IP telephony system with their aids.

There are already standards such as the Alternative Interface Interaction Protocol (AIIP) being developed by the National Center for Information Technology Standards. However, these standards need regulations to see that they are implemented and built into products. The V.18 standard for telephony modems is a good example of a standard which was developed, but without regulation, has not been implemented

The question as posed seems to assume that telecommunications consumers will be able to choose whether or not to use IP telecommunications. However, as the use of IP spreads throughout telecommunications, and so incompatibility of assistive technology could cut off the ability to communicate using the telecom products and services they encounter on a daily basis. This would be a serious access problem. We hope that industry-wide, the problem can be solved before it begins to affect consumers.

Because the possibility of garbling TTY is known, compatibility with TTY is a key issue in this proceeding. It is our view that text TTY telephones should be accommodated by technologies just as voice telephones are. The new voice technologies being developed are backward compatible with analog wireline phones. If this is the case, they should be compatible with analog TTYs as well.

At the same time, we recognize the obvious need to migrate away from analog devices to digital devices in as effective a manner as possible, without losing functionality in telecommunications during the transition. This is a goal which many share. Text telecommunications is inherently digital and should merge readily with other digital communications.

Standards as a tool for TTY migration and compatibility

Some of the commenters in this proceeding have been working in the background with some engineers in industry to try to move forward with compatibility between TTYs and other text communication protocols leading to the eventual migration from TTY. The first effort in this regard was an effort by Gallaudet to meet with TTY manufacturers in the early '90s to discuss better, standardized implementations of ASCII in TTYs. Recognizing that the issue is an international one, Richard P. Brandt took the issue of compatibility between modems and TTYs to ITU-T Study Group 14, of which he was at the time Vice Chairman. The result of his initiative was Recommendation V.18, which addresses not only compatibility between domestic analog TTYs and data communications equipment, but also with international text telephone protocols.

This work within ITU was continued and expanded into the all-digital environment by Gunnar Hellstrom of Sweden. His work and the work of industry in crafting digital text channels and protocols are exemplary. See "Total Conversation and Text Telephony in the IP Revolution", appended.) The development of standards for digital text chat to be used in a variety of communications media, whether IP or not, is a major step in the right direction. It looks ahead to the future and lays a path for migration and integration of text chat into all forms of multimedia. (We note as an aside that his early work on accessibility within the ITU was supported by the Swedish counterpart to the FCC.)

As Hellstrom notes, "It is a good habit of the industry to *unite* in creating standards for communication methods and *compete* in creating the smartest implementations of the standards" (Hellstrom, 1999). The contributions of engineers in the standards groups to the development of T.140, V.18, and emerging standards have been admirable. It is in the latter area – competition during implementation -- that we have lingering concerns. To date, the implementation of V.18 has not occurred in "mainstream" products, or for that matter in any domestic products, although it was initially approved in ITU-T in 1994. British Telecom funded development and testing of V.18 and even developed a testing protocol – but still the technology has not been picked up. T.140 has not been implemented either, to our knowledge. There is a growing number of technical standards for accessibility, but only those required by government are being implemented.

While commenting on text conversation standards, we note that mobile/wireless telecommunications is yet another area in which migration to digital text telephony is advisable and should be considered now, as the new generations are being planned and developed. We should aim for a single system of text telecommunications worldwide once end-to-end digital telephony is in place if we want to see an eventual migration from the universal TTY solution to text communication using more standard technologies.

181. To what extent is IP telephony now or will soon be a common effective substitute for conventional circuit switch telephony? How extensive is Internet telephony usage today? What is the projected usage of Internet telephony in the future? What is the projected use of the various kinds of IP telephony by persons with disabilities?

Almost all very long calls are digital in the middle. All of the big carriers probably use high enough quality in their digital legs that transmission quality should pose no problem, even for TTY signals and for those with poor speech or hearing. However, smaller carriers may, in an attempt to gain a cost advantage, provide lower quality digitalization that could cause problems for individuals with speech or hearing disabilities as well as those who use TTY's.

When trying to project the use of various kinds of IP telephony by persons with disabilities, it is probably best to look at the projected usage by everyone. In general, if any significant portion of the standard population is using IP telephony, then this will be mirrored in the disability population. Also, if it is being used in public places, then those will be the systems available to people with disabilities as well. If they are not accessible, this will be a real problem. If they are not required to be accessible, then accessibility is likely to be irregular at best.

With regard to the extent to which IP telephony will take over for conventional switch circuit telephony. It is clear that in the long run the trend is toward some type of packet based transmission of information throughout the networks. There is a tremendous amount of installed based, however, which may provide some inertia. However, in the light of competition, installed basis can quickly present an operational or competitive disadvantage. If this happens, they can be quickly swept away.

182- A. What are the differences in characteristics between computer based and phone based IP telephony? And do such differences merit different treatment by the commission.

As noted in the preface above, there are not really two separate kinds of IP telephony. Instead, there is a continuum that goes seamlessly and continuously from what might be thought of as phone based IP telephony at one extreme and what might be thought of as a personal computer based IP telephony at the other. Since there is this continuum, it will not be possible to clearly divide the range of devices into one category or another. In addition, any attempt to do so will result in a great deal of confusion by FCC staff, industry and consumers given the fact that even the phone based IP telephony would be carried out with phones which include the same computer technologies as found on PC's. There would seem to be no reason to try to differentiate between the two.

One might argue that computer based systems are programmable and, therefore, more flexible than phone based IP telephony. In fact, only an extremely small number of consumers will be capable of reprogramming their computers to behave differently from the way they are programmed in the standard software they purchase. Both computer program based and phone based telecommunication products can be programmed from the beginning to provide additional modes or interface variations which would accommodate people with a wide range of disabilities.

182 - B. Apprise us of any new technologies that may impact availability of accessible services and equipment.

There are a wide range of new technologies that are emerging which would impact the availability of accessible services and equipment. Three key ones are:

- The myriad of mobile computing technologies.
- The new short-range wireless networking technologies (e.g., Bluetooth).
- The home wiring networking technologies, which allow products to link with each other over home wiring.

These three technologies provide individuals with disabilities with the ability to move about and yet stay connected with telecommunication products and telecommunication networks without having to be able to find and manipulate connectors. This will allow individuals with severe or extreme disabilities to be able to use special assistive technologies with the new telecommunication systems that are emerging.

For individuals with mild to moderate disabilities, the fact that essentially all new telecommunication products have microcomputers built into them, which control their behavior, means that it is fairly straightforward for next and next, next generation of telecommunication products to behave flexibly to meet the needs of a wide range of users.

183-185 We seek comment on…the movement of telecommunication and information services from the network…into computer equipment which does not connect to the public network directly. Would failure to bring these types of equipment under the regulation result in a serious gap. Is there a statutory basis for coverage of the equipment?

If the equipment originates, routes or terminates telecommunications, it is in some way connected to the rest of the network – unless it is a closed telecommunications system used only within an organization (and there are few such systems).

The statute covers telecommunications. Because of its function, this type of equipment meets the definition of telecommunications equipment and CPE. The ability to place phone calls is involved. Artificially separating telecommunication products and services into covered and not-covered categories based on the underlying technology alone would not only cause serious accessibility gaps but also lead to much confusion and a very uneven playing field for different companies. It will also lead to a situation where virtually identical products could be covered or not covered simply based upon the technology used to implement them or the networks used to interconnect them. It could also result in phone conversations where the products at one end of a call were covered but not the phones at the other end of the call; even where the phones in one room or area of a hotel would be accessible but not the phones in another room or area of the same hotel. People with disabilities would no longer be able to pick up a phone and call with

any degree of confidence. People on some parts of the network would not be able to reach the relay service or 9-1-1, if calling from a locale with a system that garbles TTY either locally within the CPE or within the network.

Federal Communications Commission. (1999). The FCC and the Unregulation of the Internet. (Office of Plans and Policy Working Paper No. 31). Washington, DC: Jason Oxman.

Hellstrom, G. (1999) Total Conversation and Text Telephony in the IP Revolution. *Presentation to the VON coalition meeting with Accessibility Actors and the FCC. Monday, December 13, 1999, Washington DC*

Pappalardo, D. and Green, T. (January 11, 2000) Voice over IP gathers steam. Available: http://www.cnn.com/2000/TECH/computing/01/11/voice.ip.idg/index.html

Riezman, M. J. (2000). Communications IEEE Spectrum, 37(1), pp33-38.

Respectfully submitted,

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Appendix

Total Conversation and Text Telephony in the IP revolution.

Presentation to the VON coalition meeting with Accessibility Actors and the FCC.
Monday, December 13, 1999, Washington DC

By

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Summary

Telecom services are rapidly going through an IP revolution. More and more services get IP based by adopting Internet Protocols or being provided in the Internet. This change imposes opportunities and risks for the users.

This document clarifies how recently developed telecom standards can contribute to better accessibility to conversational telecom services including Text Telephony. By introducing standards for text conversation, text can be combined with video and voice. Important opportunities are opened. The combination is called Total Conversation. The document explains the situation in standardisation of text conversation functions. Most components are ready or near to be approved in international standardisation, while the important gateway work, needed to bridge between different networks is still in the middle of intensive work.
Of special importance is the provision of methods for interworking with text telephony in the telephone network.

Many companies and organisations contribute to the standardisation of accessible telecommunications, co-ordinated from the working group ITU-T Q9/16 “Accessibility to Multimedia”.

IP Telephony offers accessibility improvements

The growth of IP Telephony offers an opportunity to implement more accessible telecommunication services while preserving compatibility with the old.

If any new technology is to be accepted by the users of text conversation, it should enable contacts with the current users of text telephony. For a great number of people with hearing impairment, deafness, deaf-blindness and speech impairments, the current TTY and other text telephones are important tools for distant personal conversations. Communication with newer systems could be established preserving interworking with the old.
Interworking is always arranged between voice telephones in different networks. The ambition behind the standardisation activities for text conversation is to make that possible also for text.

When defining standards for IP Text Conversation, it is important to base the work on the most dominating standards for IP Telephony and IP Multimedia, so that products of general interest with accessibility features can be designed.

In IP based networks, it is easy to establish simultaneous communication in text, video and voice in any combination. That can open conversational services for a large number of users who do not find today´s TTY:s to be a suitable alternative for communication and therefore do not benefit from telecomm services today.

The first step - standardisation of Total Conversation

Text Telephony can be seen as a limited special case of multimedia conversation.

There are recommendations developed now, defining the concept of Total Conversation as an extension of Video Telephony, including video, *text* and voice. It is possible to select only one or two of these media in an implementation. An example can be an IP Text Telephone only implementing text and voice, allowing truly simultaneous text and voice operation.

It is important to have standardised solutions for Total Conversation in all networks, including IP networks as well as Mobile networks, ISDN and the telephone network.

The combination of video, text and voice, offers a great increase in usability in personal conversation, because the users can use a combination of modes that suit the situation for the moment.

One example could be a hearing impaired person who can perceive a conversation quite well with the combination of voice and good video for lip-reading but occasionally need to revert to getting something typed in the text part of the conversation.

Another example may be in video relay services. Interpreters working in video relays with plain videophones say that the text addition would be essential for the efficiency of the service for conveying the telephone number from the user. That task is tedious without the text capability.

Total Conversation can be extended by local adaptations. It can be deaf-blind people needing text output through a screen reader, it can be adult deaf people who may be eager to use automatic voice–to-text translation to make communication convenient.

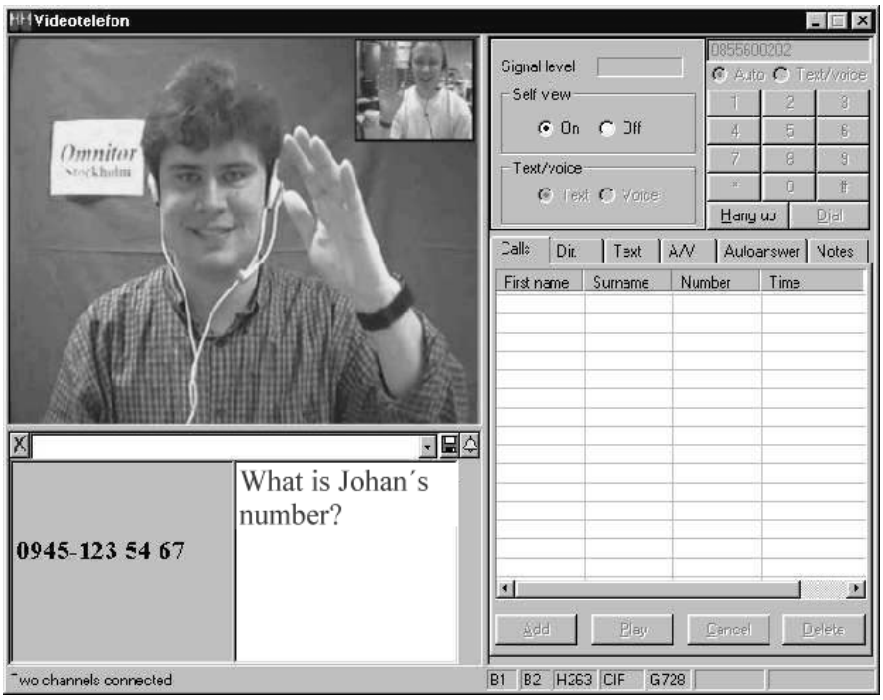

Figure: Example of a Total Conversation terminal for video, text and voice.

Standardise in powerful organisations

The work with standardisation of Total Conversation is handled both in ITU-T and IETF.

ITU-T is the International Telecommunications Union. It has settled most standards for video telephony, voice telephony, fax, modem and text telephony that are in common use now.

IETF is the Internet Engineering Task Force, and it manages standards to be used in IP networks.

These two organisations dominate international standardisation in telecommunications and the Internet. Since they created the dominating basic standards environments where text conversation is needed, they form the natural place for the additions creating Total Conversation.

International standards act as catalysers on implementations. It attracts efforts from industry and usage from customers, thus accelerating the benefit for all involved parties. It is a good habit of the industry to *unite* in creating standards for communication methods and *compete* in creating the smartest implementations of the standards.

T.140, the standardised text addition to multimedia systems

When text is transmitted in the Total Conversation environment, it is coded as text in the internationally dominating Unicode code, with a robust transformation called UTF-8. This is the prevailing code for most new text oriented services. The application of this code in text conversation is specified in Recommendation ITU-T T.140. It specifies that text shall be transmitted character by character or in small chunks, to give the best conversational flow, just like today's text telephones.

Each network environment have its own data transport mechanisms, and it must therefore be specified how T.140 codes are to be transmitted in each environment.

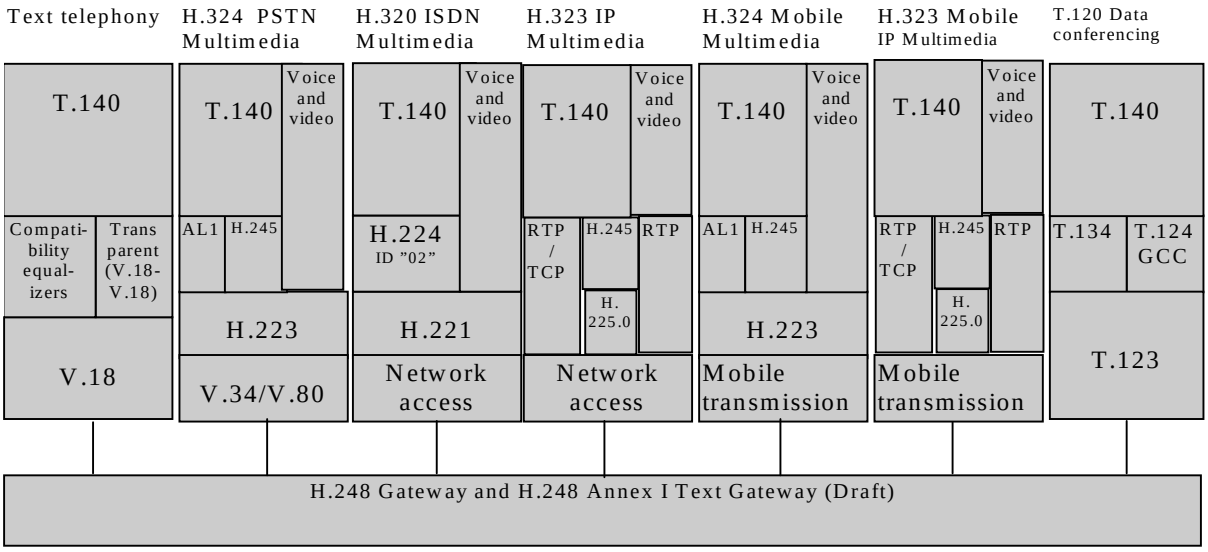

Figure: The Total Conversation standard family (note, not all approved yet)

IP Text Telephony in line with IP Telephony

The recommendations for Total Conversation in IP networks are based on the same protocols as the IP Telephony protocols. IP Total Conversation is a superset of IP Telephony. Therefore, in this era of growing support for IP Telephony, Total Conversation offers the opportunity to create accessibility in a universal way.

Addition to H.323 multimedia communication in ITU

The currently prevailing standard for IP telephony and IP Multimedia is ITU-T H.323. In order to expand H.323 to also include text conversation and a simple text telephone is specified as "H.323 Annex G Text Conversation and Text SET". The strategy is to let text transmission follow the same method as audio and video. A channel is established for each medium directly between the endpoints involved in a call. By this strategy, the from video phone to "total phone" and from IP telephone to IP textphone will be smooth. Inclusion in gateways and services will not be hindered by any major technical obstacles.

Transmission method standardised in IETF

In order to establish the IP text conversation standard, a transmission protocol was needed for T.140 in the IP environment. Both Audio and video make use of a protocol from IETF called RTP. A specific RTP payload description was specified for T.140 data including optional use of a redundancy mechanism in order to decrease risk of loss of text. Data loss is always a risk in IP networks, and different mechanisms are applied to keep the risk low. The RTP payload specification for text is in the process of being approved. It has been implemented and proven to function well. An application is also issued for registration of this T.140 text transport as a MIME registered medium. That makes it possible to use T.140 in other IP applications and protocols.

Next multimedia protocol "SIP" in IP networks is "text ready"

A second Multimedia protocol to be used in IP telephony and IP Multimedia communication is the IETF Session Initiation Protocol, SIP. It is not yet as well established as H.323, but used in some implementations. By specifying a text transmission for text in RTP, and registering it as a MIME medium, it will be ready for inclusion in SIP implementations without further standardisation. Thereby SIP is "text

ready". SIP and H.323 are expected to live side by side in the IP networks, with gateways or multifunction protocols securing interworking between them.

Gateway needs

For the described evolution to take place, compatibility need to be established with

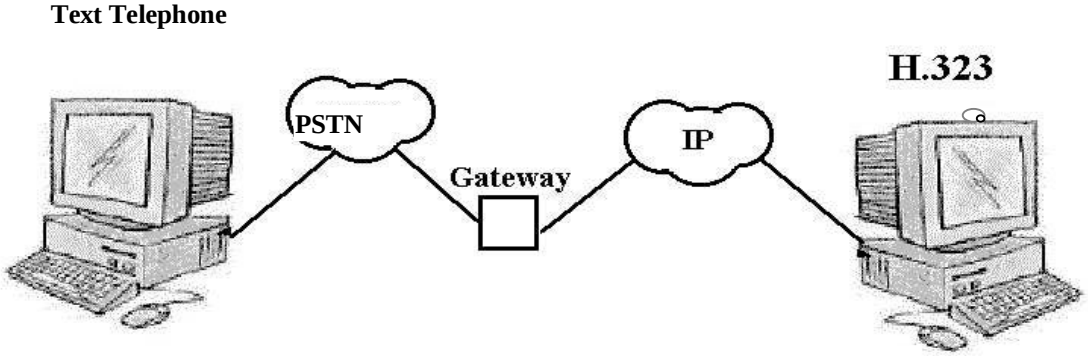

Figure: Example of use of a Gateway.

corresponding services in IP networks, in the telephone network and mobile networks. The main services to take into consideration are text telephony and voice telephony. While the main current emphasis is on voice telephony, there are movements to also specify interworking between text telephony (TTY) in telephone networks and IP Text Telephony.
Compatibility is arranged by describing Text Conversation and Text Telephony additions to the standards for IP gateways. This work is just now taking place in the ITU and IETF. The accessibility additions are made in phase with other definitions of gateway functions. The work is done under the name of H.248 Annex I in ITU-T Study Group 16 and in the Megaco working group in the IETF.
The user requirements were specified in IETF. The text telephone compatibiltity requirements specify different ambition levels for the support:

Gateway requirements

The following text is directly fetched from IETF Megaco requirements.

"11.2.4. Trunking/Access Gateway with text telephone access ports

An access gateway with ports capable of text telephone communication, must provide communication between text telephones in the SCN and text conversation channels in the packet network.

Text telephone capability of ports is assumed to be possible to combine with other options for calls as described in section 11.2.6 (e.) on "Adaptable NASes".

The port is assumed to adjust for the differences in the supported text telephone protocols, so that the text media stream can be communicated

T.140 coded in the packet network without further transcoding [7].

The protocol must be capable of reporting the type of text telephone that is connected to the SCN port. The foreseen types are the same as the ones supported by ITU-T V.18: DTMF, EDT, Baudot-45, Baudot-50, Bell, V.21, Minitel and V.18. It should be possible to control which protocols are supported. The SCN port is assumed to contain ITU-T V.18 functionality [8].

The protocol must be able to control the following functionality levels of text telephone support:

a. Simple text-only support: The call is set into text mode from the beginning of the call, in order to conduct a text-only conversation.

b. Alternating text-voice support: The call may begin in voice mode or text mode and, at any moment during the call, change mode on request by the SCN user. On the packet side, the two media streams for voice and text must be opened, and it must be possible to control the feeding of each stream by the protocol.

c. Simultaneous text and voice support: The call is performed in a mode when simultaneous text and voice streams are supported. The call may start in voice mode and during the call change state to a text-and-voice call.

A port may implement only level a, or any level combination of a, b and c, always including level a.

The protocol must support:

d. A text based alternative to the interactive voice response, or audio resource functionality of the gateway when the port is used in text telephone mode.

e. Selection of what national translation table to be used between the Unicode based T.140 and the 5-7 bit based text telephone protocols.

f. Control of the V.18 probe message to be used on incoming calls."

The international text telephone standard V.18 – a prerequisite for a gateway specification.
The gateways need to support conversion between the tone coded text telephone methods used in the telephone network and the T.140 data coding of text used in the IP network. How that can be done is described in the gateway work in the standards groups.

An important prerequisite for that work was to have the international text telephone standard V.18 to refer to in the work. It is now possible to name text telephone support with one term "V.18" in overviews, and leave the details for the technical specifications.

ITU-T V.18 is backwards compatible with all textphone methods. It can be used in gateways and form a bridge to the digital world.

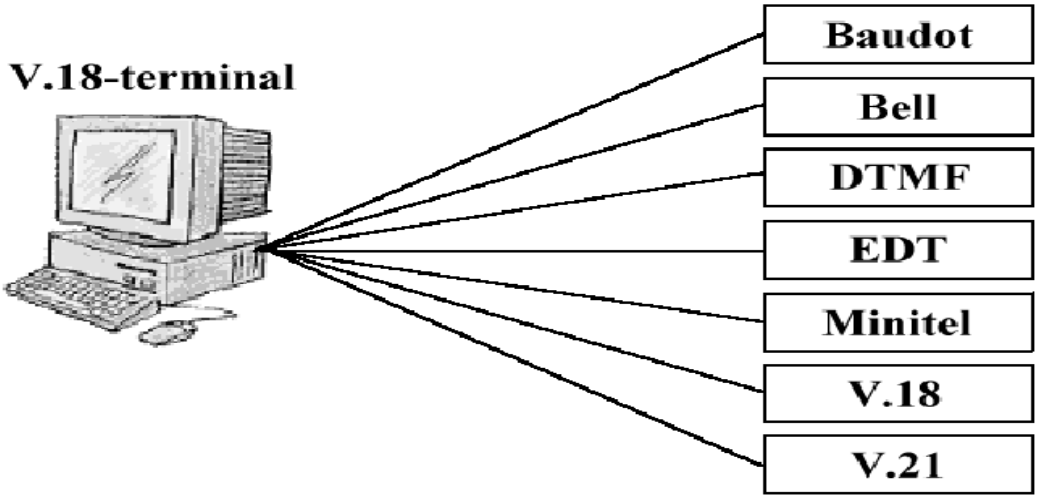

Figure: A V.18 equipped text phone or gateway can communicate with all types of textphones.

A need to integrate with fax and modem gateway specifications
Also fax, modem and voice traffic have the same need as text phone traffic to go through IP networks or end in IP networks. For proper handling of these four uses of the telephone network, an integrated specification must be created. Work has started, and the main part of that work should be ready in February 2000, in the form of a joint draft Annex to the H.248 gateway protocol specification.

Without text gateways - no guarantee of text transmission.

If the text telephone gateways are not implemented, there is no guarantee that TTY tones will be carried well as audio coded information by the gateways. That is one additional reason why the Total Conversation concept is preferable to apply, with gateways identifying TTY connections and converting between TTY tones and Text Conversation data codes.
The gateways will be used in two ways, as gateways between different networks, and to create a transit path through IP networks for telephone network users.
If the ports to the telephone network were provided with V.18 capabilities to be able to detect and decode text telephone traffic, and T.140 was used as the common text protocol on the IP side transported on RTP or TCP, text telephone calls could flow both between telephone network users and between the network types.

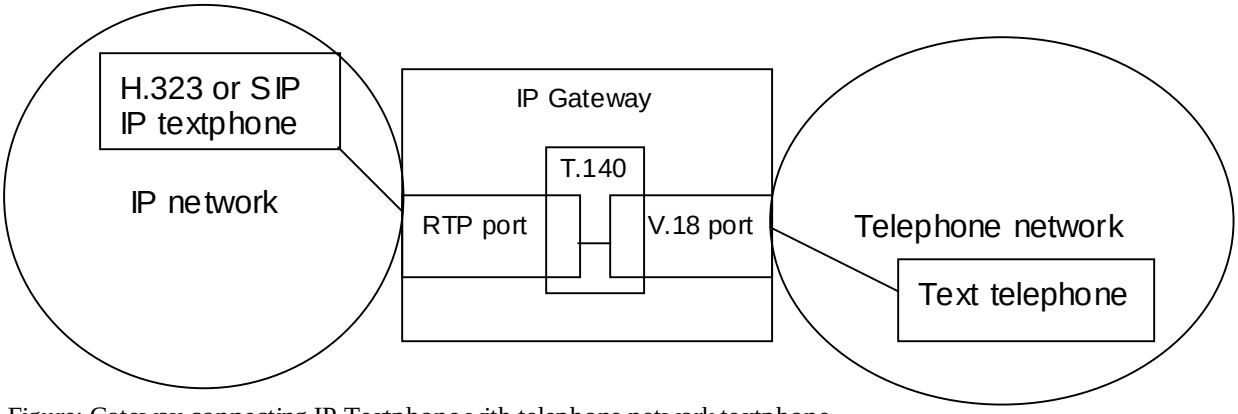

Figure: Gateway connecting IP Textphone with telephone network textphone

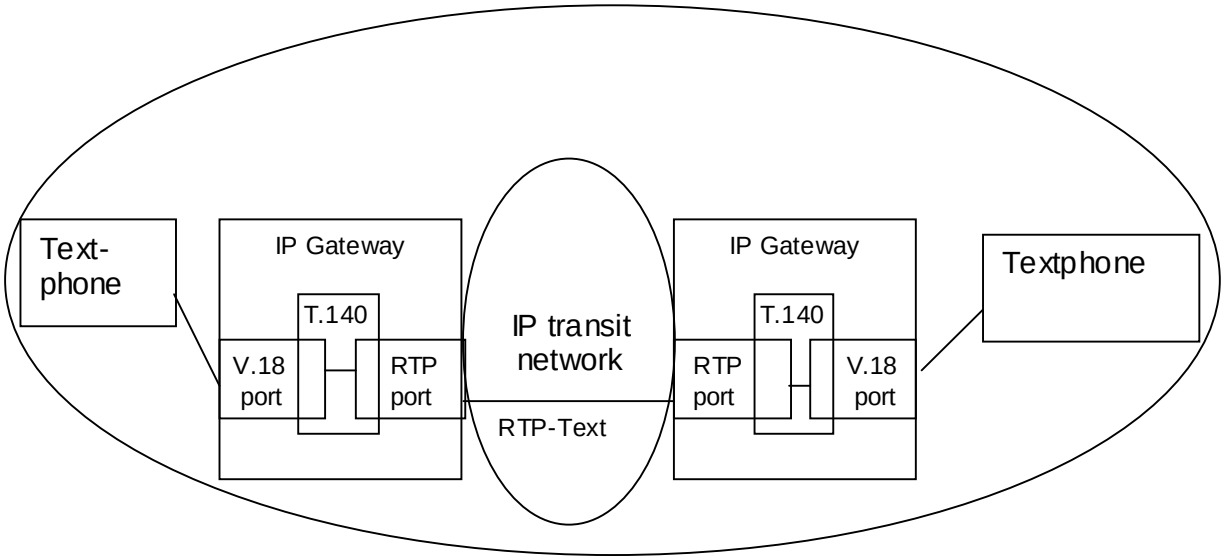

Figure: IP transit network in textphone call

Mobile networks

IP networks are not the only new network to consider. The next generation mobile networks are just emerging. They can support multimedia conversation. The Total Conversation standards are made so, that they can be applied also in these mobile networks. The work with gateways are valid also for entry to mobile networks, and by applying the same architecture with T.140 as the common protocol, interworking can be achieved.

Industry efforts

The industry now makes efforts to finalize the Total Conversation concept and the standardise the gateway between text telephony (TTY) and IP Total Conversation. It should be remembered

that standardisation and implementation in operational services are separate processes. Approved Recommendations for Total Conversation support in IP networks are important prerequisites for smoothly interworking services.
Many companies and organisations are contributing to the standardisation process.
Gunnar Hellström from Omnitor, Sweden has co-ordinated it from 1997-2000 as Rapporteur for ITU-T Q9/16 Accessibility to Multimedia Systems and Services, first on behalf of the Swedish Post and Telecom Agency and later on behalf of LM Ericsson.

Conclusion

The emerging Total Conversation concept adds text conversation to all major multimedia conversation standards. The addition is made in a way that is intended for smooth implementation. One common presentation level, ITU-T T.140 is used, based on the internationally useful Unicode standard.

Any combination of text, video and voice can be implemented and terminals implementing different subsets can communicate in common modes.

It is therefore possible to create IP text telephones.

Interworking with the current text telephones can be accomplished through standardised gateways that also can be involved for cases when the IP network is just used as a transit network.

Suitable standards and standard proposals exist. Total Conversation can be implemented to serve the text telephone users in new networks.

Standardisation summary.

This is a list of standards and drafts related to Total Conversation and Text Telephony.

1. ITU-T V.18, approved 1994, amended 1998. Text telephone modem Recommendation, with automoding to Baudot, DTMF, EDT, V.21, Bell, Minitel and V.18, also used in the gateway work as a bridge to IP text conversation. Requires use of T.140 between V.18 terminals.

2. ITU-T T.140, approved 1998, amended 1999. Common text conversation presentation level, based on Unicode UTF-8. Makes it simple to establish character by character text conversation with interworking in a new environment.

3. ITU-T T.134, approved 1998. Transport of T.140 in T.120 data conferencing environment.

4. ITU-T modification to H.324 to include transport of T.140 in circuit switched multimedia calls. Decided 1998. Can be used for Mobile Text Conversation.

5. ITU-T H.224, revision, for decision in feb. 2000. Transport of T.140 in ISDN H.320 Multimedia is enabled by allocating Client Id=2.

6. ITU-T H.323 Annex G, Text conversation and text SET, for decision in Feb. 2000. Transport of T.140 in IP telephony and IP Multimedia conversation.

7. IETF RTP-payload for text conversation. Last call 1999-12-08. Intended to be RFC before end of 1999. Transport mechanism for T.140 to be used in H.323 and SIP.

8. IETF Megaco requirements 09. IP gateway requirements including text telephone gateway requirements. Last call 1999-12-10. Planned to be RFC before end of 1999.

9. H.248 Annex I. Text conversation and Text telephony packages. Additions to the gateway protocol specification H.248 for text telephony and text conversation. Draft, to be integrated with fax and modem specifications before Feb- 2000.

10. IETF Megaco packages. The text packages for H.248 gateway combined with other packages in a common package draft specification in IETF. Should be developed in parallel with H.248 Annex I.

11. ITU-T F.MVCS Service description: Multimedia Conversation Services. Draft, including text telephony and Total Conversation.

12. Modifications and additions for Total Conversation and text telephony are made to:
    H.245: Multimedia control for management of T.140 channels,
    V.8: Modem Handshake for defining V.18 text telephone call function,
    V.8 bis Modem handshake to select modulation and simultaneous text and voice for text telephony and telephone network multimedia,
    V.250 DCE control language to control a V.18 modem,
    Q.931 Connection procedures to define selection of a V.18 modem,
    T.120 data conferencing to add the Text Conversation application T.134 to the T.120 family.

13. ITU-T H-series supplement 1: Application profile for sign language and lip reading use of low bitrate video comunication.(in preparation for publication). Full Total Conversation should also explore the potential of communicating in video with sufficient quality for sign language and lip reading. This document give some guidance.

Mail list and links

Text telephony and Total Conversation with special focus on standardisation aspects is dicussed in the mail list textphone@lsv.pi.se
Membership is achieved by mailing an e-mail to listserv@lsv.pi.se with no subject and one line message saying
Subscribe textphone /your name/
(Replace /your name/ with your name.)

The ITU Work can be followed through www.itu.int Standards SG16.

The IETF work can be followed through www.ietf.org working groups “avt” and “megaco”.